

Claims

1. A polylactic acid resin mainly comprising linear polylactic acid comprising 95 mol% or more of L-isomer, wherein the resin contains 30 ppm or less of Sn and 0.5% by weight or less of monomer content with a relative viscosity  $\eta_{rel}$  of 2.7 to 3.9.
2. A polylactic acid resin mainly comprising linear polylactic acid comprising 95 mol% or more of L-isomer, wherein the resin contains 30 ppm or less of Sn content and 0.5% by weight or less of monomer content with a weight average molecular weight  $M_w$  of 120,000 to 220,000 and a number average molecular weight of 60,000 to 110,000.
3. A polylactic acid yarn comprising the polylactic acid resin according to claim 1 or 2.
4. A process for producing the polylactic acid yarn by melt-spinning using the polylactic acid according to claim 1 or 2.
5. A multifilament comprising a linear polylactic acid resin containing 98 mol% or more of the L-isomer, 30 ppm or less of Sn content and 0.5% by weight or less of monomer content with a relative viscosity  $\eta_{rel}$  of 2.7 to 3.9.
6. A multifilament comprising a linear polylactic acid resin containing 98 mol% or more of L-isomer, 30 ppm or less of Sn content and 0.5% by weight or less of monomer content with a weight average molecular weight  $M_w$  of 120,000 to 220,000 and number average molecular weight  $M_n$  of 60,000 to 110,000.
7. A multifilament according to claim 5 or 6 having a tensile strength of 3.9 cN/dtex or more, a contraction ratio in boiling water of 12% or less, a birefringence  $\Delta n$  of 0.030 or more, and a thermal stress peak temperature of 85°C or more.
8. A polylactic acid multifilament according to claim 5 having an inert of 3.0 or less and a contraction ratio in boiling water of 12% or less.
9. A process for producing a polylactic acid multifilament using polylactic acid according to claim 5 or 6 comprising the steps of: spinning at a speed of 3,000 m/min or more and 5,000 m/min or less;

drawing by 1.3 times or more at a draw temperature of 100°C to 125°C; and heat-setting at a temperature of 125°C to 150°C.

5           10. A process for producing a polylactic acid multifilament using the polylactic acid resin according to claim 5 comprising the step of drawing between a roller heater (1) and roller heater (2) followed by heat-setting with the roller heater (2).

10           11. A polylactic acid staple fiber comprising the polylactic acid resin according to Claim 1 or 2.

15           12. A polylactic acid staple fiber according to claim 11 having a tensile strength of 2.6 cN/dtex or more, a elongation of 80% or less, a contraction ratio in boiling water of 5.0% or less and a number of crimp of 4 to 19 crimps/25 mm.

20           13. A process for producing a polylactic acid staple fiber using the polylactic acid resin according to Claim 1 or 2 comprising the steps of: spinning at a speed of 600 to 1,200 m/min; drawing by 3.0 to 5.0 times; and heat-treating at 110°C to 25   150°C.

30           14. A polylactic acid monofilament comprising a polylactic acid resin mainly comprising linear polylactic acid containing 95 mol% or more of the L-isomer, 30 ppm or less of Sn content and 0.5% by weight or less of monomer content with a relative viscosity of 2.7 to 4.5.

35           15. A polylactic acid monofilament comprising a polylactic acid resin mainly comprising linear polylactic acid containing 95 mol% or more of L-isomer, 30 ppm or less of Sn content and 0.5% by weight or less of monomer content with a weight average molecular weight Mw of 120,000 to 220,000 and 40   a number average molecular weight Mn of 60,000 to 110,000.

45           16. A polylactic acid monofilament according to Claim 14 or 15 having a tensile strength of 3.5 cN/dtex or more, an elongation of 40.0% or less, contraction ratio in boiling water of 10.0% or less and a birefringence  $\Delta n$  of 0.0250 or more.

50           17. A process for producing a polylactic acid monofilament using the polylactic acid resin according to Claim 14 or 15 comprising the steps of:

spinning at a temperature of 220 to 250°C, drawing with a draw magnification factor of 6.0 or more at 70 to 100°C, and heat-treating at 100 to 150°C.

5            18. A flat yarn comprising as a starting material a linear polylactic acid resin containing 95 mol% or more of L-isomer.

10           19. A flat yarn according to claim 18, wherein the polylactic acid resin contains 0.5% by weight or less of monomer content.

15           20. A flat yarn according to any one of claims 18 and 19, wherein the polylactic acid resin contains 30 ppm or less of Sn content.

20           21. A flat yarn according to any one of claims 18 to 20, wherein the polylactic acid resin has a relative viscosity of 2.7 to 4.5.

25           22. A flat yarn according to any one of claims 18 to 20, wherein the polylactic acid resin has a Mw of 125,000 to 230,000 and a Mn of 73,000 to 116,000.

30           23. A flat yarn according to any one of claims 18 to 22 having a tensile strength of 2.6 cN/dtex or more, an elongation of 40.0% or less, and a contraction ratio in hot air at 80°C for 10 minutes of 5.0% or less.

35           24. A process for producing a flat yarn comprising a polylactic acid composition mainly comprising the polylactic acid resin according to any one of claims 18 to 22.

40           25. A process for producing a flat yarn resin comprising a polylactic acid resin comprising the step of melt-extruding the polylactic acid resin according to any one of claims 18 to 22 to form a film followed by drawing at a drawing temperature of 80 to 130°C with a draw magnification factor of 4.0 or more.

45           26. A polylactic acid false-twist yarn mainly comprising a polylactic acid resin, wherein the monomer content in the polylactic acid is 0.5% by weight or less.

50           27. A polylactic acid false-twist yarn according to claim 26 containing 95 mol% or more of

L-isomer in the polylactic acid resin.

28. A polylactic acid false-twist yarn  
according to claim 26 or 27 comprising a linear  
5 polylactic acid resin.

29. A polylactic acid false-twist yarn  
according to claims 26 to 28, wherein the polylactic  
acid resin has  $\eta_{rel}$  of 2.7 to 3.9.  
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30. A polylactic acid false-twist yarn  
according to claims 26 to 29, wherein the polylactic  
acid contains 30 ppm or less of an Sn content.

31. A polylactic acid false-twist yarn  
according to claims 26 to 30 having a tensile  
strength of 2.4 cN/dtex or more.  
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32. A polylactic acid false-twist yarn  
according to claims 26 to 31 having an  
expansion/contraction recovery ratio of 10% or more.  
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33. A process for producing a polylactic acid  
false-twist yarn using a non-drawn polylactic acid  
yarn comprising the polylactic acid resin according  
to claims 26 to 30 having  $\Delta n$  of 0.010 to 0.035, and a  
tensile strength  $S$  (cN/dtex) and ultimate elongation  
percentage  $E$  represented by the relation of  $15 \leq S \times$   
 $\sqrt{E} \leq 23$ , wherein the non-drawn polylactic acid yarn  
is subjected to a simultaneous draw and false-twist  
processing at a draw temperature of 110°C or more and  
draw magnification factor of 1.3 to 1.8.  
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34. A binder yarn mainly comprising yarns of  
a polylactic acid resin, wherein the polylactic acid  
resin as a starting material is a linear polylactic  
acid composition containing 90 mol% or more of L-  
isomer and having a relative viscosity of 2.7 to 3.9,  
a monomer content of 0.5% by weight or less and an Sn  
content of 30 ppm or less.  
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35. A binder fiber mainly comprising yarns of  
a polylactic acid resin, wherein the polylactic acid  
resin as a starting material is a linear polylactic  
acid composition containing 90 mol% or more of L-  
isomer and having  $M_w$  of 120,000 to 220,000 and  $M_n$  of  
60,000 to 110,000 with a monomer content of 0.5% by  
weight or less and an Sn content of 30 ppm or less.  
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36. A binder fiber according to claim 34 or  
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35 having a core-and-sheath structure, wherein the  
core part contains the polylactic acid resin  
comprising 98% or more of L-isomer and the sheath art  
contains the lactic acid resin comprising 90% or more  
5 of L-isomer.

37. A binder fiber according to claim 36  
having a core-and-sheath structure, wherein the  
proportion C (mol%) of L-isomer in the core portion  
10 polylactic acid and the proportion S (mol%) of L-  
isomer in the sheath portion polylactic acid  
satisfies the relation of  $2 \leq C - S \leq 8$ .

38. A binder fiber according to claim 37  
15 having a tensile strength of 2.6 cN/dtex or more, an  
elongation of 80% or less, a heat-contraction ratio  
at 80°C of 15.0% or less, and a number of crimp of 4  
to 18 crimps/25 mm.

39. A process for producing a polylactic acid  
binder fiber for producing the binder fiber according  
to any one of claims 34 to 38 using the polylactic  
acid composition according to claim 34 or 35,  
comprising the steps of spinning at a spinning  
25 temperature of 210 to 240°C and spinning speed of 600  
to 1,200 m/min, drawing at a draw magnification  
factor of 3.0 to 5.0 at a draw temperature of 40 to  
70°C, and heat-treating at 60 to 90°C.

40. A long staple nonwoven fabric mainly  
comprising polylactic acid and having a core-and-  
sheath structure, wherein the core-to-sheath ratio is  
in the range of 1 : 1 to 5 : 1 in the area ratio, and  
wherein the sheath component comprises polylactic  
35 acid having a lower melting point than the core  
component, or a blend of polylactic acid and other  
biodegradable polymers having a lower melting point  
than polylactic acid.

41. A long staple nonwoven fabric mainly  
comprising polylactic acid and having a core-and-  
sheath structure, wherein (a) the core component  
comprises linear polylactic acid with a relative  
viscosity of 2.5 to 3.5, an Sn content of 30 ppm or  
45 less and a L-isomer content of 98% or more, and (b)  
the sheath component comprises linear polylactic acid  
with a relative viscosity of 2.5 to 3.5, an Sn  
content of 30 ppm or less and a L-isomer content of  
96% or less, the core-to-sheath ratio being 1 : 1 to  
50 5 : 1 in the area ratio.

42. A long staple nonwoven fabric of  
polylactic acid having a core-and-sheath structure,  
wherein (a) the core portion comprises linear  
5 polylactic acid having a relative viscosity of 2.5 to  
3.5, an Sn content of 30 ppm or less and a L-isomer  
proportion of 98 mol% or more, and (b) the sheath  
portion comprises a blend of linear polylactic acid  
having a relative viscosity of 2.5 to 3.5, an Sn  
10 content of 30 ppm or less and a L-isomer proportion  
of 98 mol% or more, and a polymer prepared by  
polymerizing polybutylene succinate synthesized from  
1,4-butanediol and succinic acid with urethane bonds,  
the blend containing 50 to 90% by weight of  
15 polylactic acid and the core to sheath ratio being 1  
: 1 to 5 : 1 in the area ratio.

43. A long staple nonwoven fabric of  
polylactic acid according to claims 40 to 42 having a  
20 mean fineness of 1 to 15 dtex, mass per unit area of  
fabric of 10 to 200 g/m<sup>2</sup> and longitudinal tensile  
strength of 30N or more.

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